Accuracy and Area

General Mathematics - Preliminary

Name: ____________________

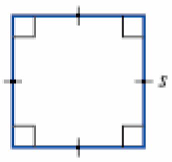
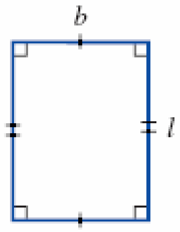
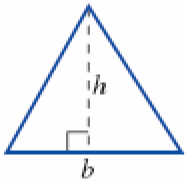
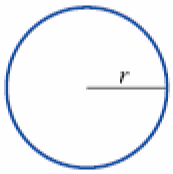
CAPACITY MATRIX – GENERAL MATHEMATICS

TOPIC: Measurement 1 & 2– Accuracy and Area 2 weeks

CONTENT	CAPACITY BREAKDOWN!	DONE IT!!!!	GOT IT!!!!!	ON MY WAY!	WORKING ON IT!	HELP!!!!
1. Calculation of area (review)	Skillsheets 3.1 & 3.2 Ex 3A Q7-19					
2. Relative error 3. Percentage error	Skillsheet 2.3 Ex 2B					
4. Significant figures	Skillsheet 2.4 Ex 2C Q1-6					
5. Scientific Notation	Ex 2C Q7-17					
6. Using field diagrams to calculate the area of irregularly shaped blocks of land	Ex 3B Practical activity					

Have your say!

REVIEW OF AREA

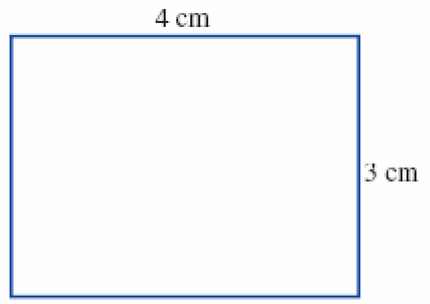
Shape		Formula
1. Square		$A = s^2$, where s is a side length.
2. Rectangle		$A = l \times b$, where l is the length and b is the breadth or width.
3. Triangle		$A = \frac{1}{2}bh$, where b is the base length and h is the height.
4. Circle		$A = \pi r^2$, where r is the radius.

REMEMBER

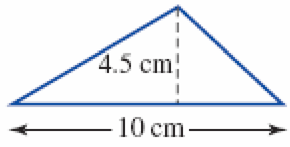
You will need to remember each of the following area formulas.

1. Square $A = s^2$
2. Rectangle $A = l \times b$
3. Triangle $A = \frac{1}{2} \times b \times h$
4. Parallelogram $A = b \times h$
5. Rhombus $A = \frac{1}{2} \times D \times d$
6. Trapezium $A = \frac{1}{2} \times (a + b) \times h$
7. Circle $A = \pi r^2$

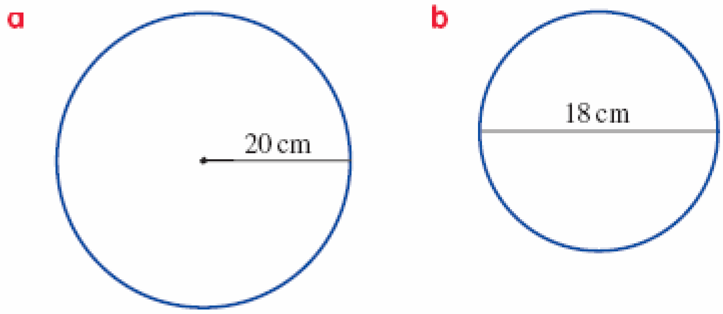
Find the area of a rectangle with dimensions shown below.



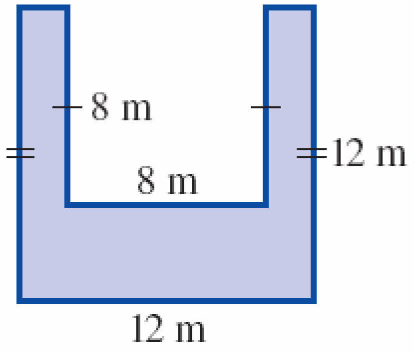
Find the area of the triangle at right.



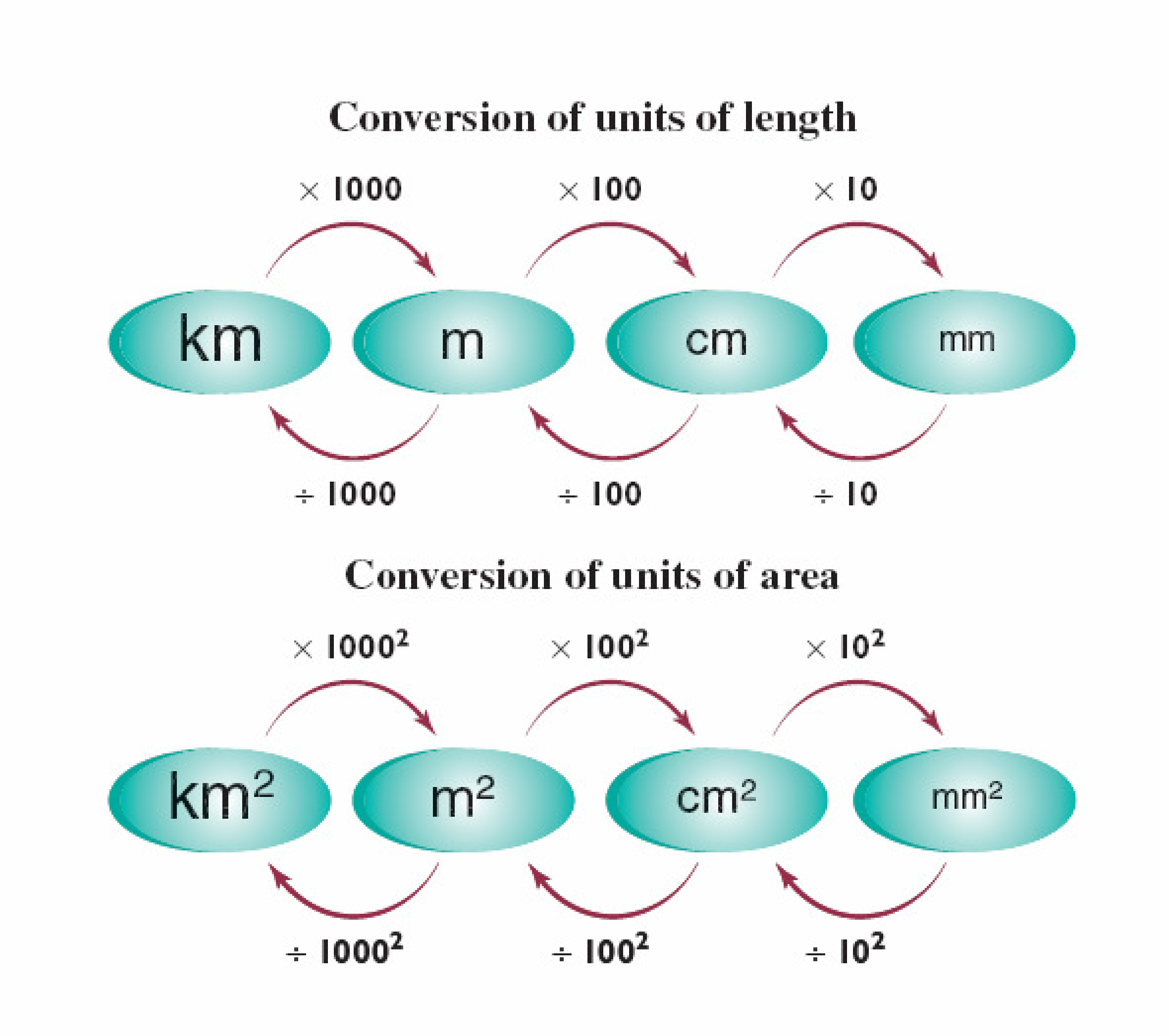
Find the area of each of the following circles.



eg Calculate the area of the shaded region



Converting Units of Area



eg Convert the following units given in brackets:

a) $2.5m^2$ [cm^2]

b) 50 000 cm^2 [km^2]

Relative Error

REVIEW:

When we need to express one quantity as a percentage of another, we write them first as a fraction, then convert the fraction to a percentage.

eg Write 45 minutes as a percentage of 3 hours.

eg Scott has $40 000 worth of shares in a jewellery company. The company pays Scott a dividend of $2300. Find the dividend yield.

All measurements are approximations!

In practice, we usually choose a degree of accuracy that is convenient eg if you say that home is 5 km to school. In this case the measurement would be given to the nearest kilometre. The actual distance could be anywhere between 3.5 km and 4.5 km.

Maximum error is **half** the degree of accuracy.

eg Elliot has his height measured at 184cm. This measurement is given to the nearest centimetre. Between what values would his actual height be?

eg The mass of a trailer load of soil is given as 260kg. The mass is given to the nearest 10 kg. Between what two masses would the true mass of the trailer load actually be?

eg A car's fuel tank has a capacity of 65 litres. If this capacity is given to the nearest litre, find the degree of accuracy as a percentage (correct to 2 decimal places)

eg Tori has her height measured by 8 people. They obtain the following results:

168cm, 169 cm, 168cm, 170cm, 169cm, 169cm, 168cm, 168cm

What is the average result?

Scientific Notation

Do you know this number, 300 000 000 m/sec.? It's the Speed of light!

Do you recognise this number, 0.000 000 000 753 kg. ? This is the mass of a dust particle!

Scientists have developed a shorter method to express very large numbers. This method is called **scientific notation**. Scientific Notation is based on powers of the base number 10.

The number 123 000 000 000 in scientific notation is written as 1.23×10^{11}.

The first number 1.23 is called the **coefficient**.

It must be **greater than or equal to 1** and **less than 10**.

The second number is called the **base**. It must always be 10 in scientific notation. The base number 10 is always written in exponent form (index form). In the number 1.23×10^{11} the number 11 is referred to as the exponent or power of ten.

Significant Figures

Every measurement has a degree of uncertainty. The number of reliably known digits in a number is called the number of **significant figures**. For example the radius of the earth is 695 000 000 m. This number is not exact but has been "rounded off" to the nearest million metres. We say the number has three **significant figures**. The zeros at the end of this number are "not significant".
In some numbers zeros are significant, eg In a measurement stated as 605mm the zero is significant. The rules for determining the number of significant figures are as follows:

- **All** non-zero digits are significant
- Zeros **between** non-zero digits are significant
- Zeros at the **end** of a decimal are significant – **WHY?** Because the trailing zeros report a greater precision than the measuring equipment supports eg 6.500m denotes that the measure of accuracy was to the nearest mm (0.001m).
- All other zeros are not significant but could be be counted as.

Using these rules 65.00 has four significant figures but each of the numbers 65, 6500, and 0.0065 has only two significant figures.

eg Round the following numbers to the number of significant figures given in the brackets.

(a) 96 302 (2 significant figures)

(b) 54.918 (4 significant figures)

(c) 0.003702 (3 significant figures)

(d) 561 045 (3 significant figures)

(e) 8.007 (1 significant figure)

(f) 23 654 067 (5 significant figures)

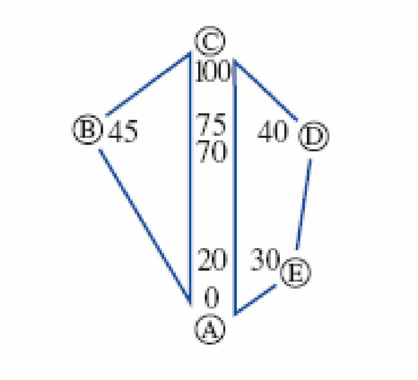
(g) 0.030048 (4 significant figures)

eg Evaluate $\sqrt[4]{\frac{(7.96)^8}{(5.78-2.44)^2}}$ and express your answer in scientific notation correct to two significant figures.

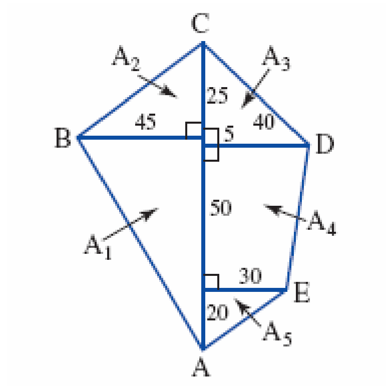
Field Diagrams

Surveyors are often required to draw scale diagrams and calculate the area of irregular shaped blocks of land. This is done using a **traverse survey.**

A **field diagram** is often used to make a scale drawing of the land.



The diagram is then split into triangles and quadrilaterals and the area calculated.



eg Use the field diagram to complete:

a) a scale drawing (1mm = 1m)

b) calculate the area of the field.